

CLAIMS

1. A method of generating a bar code signal that simulates light reflected from a bar code, comprising the acts of:
- detecting a bar code scanner signal to provide a detected bar code scanner signal;
- 5 providing a bar code signal having a first state that corresponds to a bar of a bar code and a second state that corresponds to a space of the bar code;
- providing the bar code signal with a sequence of the first state of the bar code signal and the second state of the bar code signal to simulate light reflected from the bar code; and
- 10 detecting a scanning speed of the bar code scanner signal.
2. The method as claimed in claim 1, wherein the act of providing the bar code signal comprises providing each of the first state and the second state in the sequence with a duration corresponding to a width of the bar and a width of the space in the bar code.
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3. The method as claimed in claim 2, wherein the act of providing the bar code signal further comprises adjusting the duration of each of the first state and the second state in the sequence according to the detected scanning speed of the bar code scanner signal.
- 20 4. The method as claimed in claim 3, wherein the act of providing the bar code signal comprises generating a clock signal having a clock cycle.
5. The method as claimed in claim 4, wherein the act of providing each of the first state and the second state with the duration comprises providing the duration as an integer 25 number of clock cycles of the clock signal.
6. The method as claimed in claim 5, wherein the act of adjusting the duration comprises varying a frequency of the clock signal.
- 30 7. The method as claimed in claim 1, wherein the act of detecting the scanning speed of the bar code scanner signal comprises measuring a delay interval between two detected signals.

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8. The method as claimed in claim 1, wherein the act of detecting the scanning speed of the bar code scanner signal comprises measuring a width of the detected bar code scanner signal.
- 5 9. The method as claimed in claim 1, further comprising an act of determining whether the bar code scanner signal is from a uni-directional bar code scanner or a bi-directional bar code scanner.
10. The method as claimed in claim 9, wherein the act of determining comprises determining a temporal order in which the bar code scanner signal is detected by two detectors.
15. The method as claimed in claim 1, further comprising an act of predicting a timing between successive pulses of the bar code scanner signal to provide predicted timings of the bar code scanner signal.
20. The method according to claim 11, wherein the act of providing the bar code signal comprises providing the bar code signal at the predicted timings of the bar code scanner signal.
13. A method of generating a bar code signal that simulates light reflected from a bar code, comprising the acts of:
detecting a bar code scanner signal to provide a detected bar code scanner signal;
providing a bar code signal having a first state that corresponds to a bar of a bar code and a second state that corresponds to a space of the bar code;
providing the bar code signal with a sequence of the first state of the bar code signal and the second state of the bar code signal to simulate light reflected from the bar code; and
determining whether the bar code scanner signal is from a uni-directional bar code scanner or a bi-directional bar code scanner.

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14. The method as claimed in claim 13, wherein the act of determining comprises determining a temporal order in which the bar code scanner signal is detected by two detectors.

5 15. The method as claimed in claim 13, wherein the act of providing the bar code signal comprises providing each of the first state and the second state in the sequence with a duration corresponding to a width of the bar and a width of the space in the bar code.

10 16. The method as claimed in claim 15, further comprising the act of detecting a scanning speed of the bar code scanner signal.

15 17. The method as claimed in claim 16, wherein the act of providing the bar code signal further comprises adjusting the duration of each of the first state and the second state in the sequence according to the detected scanning speed of the bar code scanner signal.

18. The method as claimed in claim 17, wherein the act of providing the bar code signal comprises generating a clock signal having a clock cycle.

20 19. The method as claimed in claim 18, wherein the act of providing each of the first state and the second state with the duration comprises providing the duration as an integer number of clock cycles of the clock signal.

25 20. The method as claimed in claim 19, wherein the act of adjusting the duration comprises varying a frequency of the clock signal.

21. The method as claimed in claim 16, wherein the act of detecting the scanning speed of the bar code scanner signal comprises measuring a delay interval between two detected signals.

30 22. The method as claimed in claim 16, wherein the act of detecting the scanning speed of the bar code signal comprises measuring a width of the detected bar code scanner signal.

23. A bar code simulator device that generates a bar code signal that emulates a light pattern reflected from a bar code, comprising:

5 at least one light source that emits a coded light signal having a first state that corresponds to light reflected from a bar of the bar code and a second state that corresponds to light reflected from a space of the bar code;

a controller that controls the at least one light source to provide the coded light signal with a sequence of the first state of the bar code signal and the second state of the bar code signal to simulate the light pattern reflected from the bar code;

10 at least one detector that detects a bar code scanner signal to provide a detected bar code scanner signal; and

detection circuitry coupled to the at least one detector that determines a scanning speed of the bar code scanner signal.

15 24. The bar code simulator device as claimed in claim 23, wherein the detection circuitry determines the speed of the bar code scanner signal by determining a width of the detected bar code scanner signal.

20 25. The bar code simulator device as claimed in claim 23, wherein the at least one detector comprises first and second detectors that provide respective first and second detected bar code scanner signals.

25 26. The bar code simulator device as claimed in claim 25, wherein the detection circuitry determines the scanning speed by determining a delay interval between the first and second detected bar code scanner signals.

27. The bar code simulator device as claimed in claim 25, further comprising a light barrier that separates the first and second detectors.

30 28. The bar code simulator device as claimed in claim 23, further comprising a light pipe that is light coupled to the at least one detector.

29. The bar code simulator device as claimed in 23, wherein the controller controls the at least one light source to provide the coded light signal with the first state and the second state having a duration corresponding to a width of the bar and a width of the space in the bar code respectively.

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30. The bar code simulator device as claimed in 29, wherein the controller adjusts the duration of each of the first state and the second state in the sequence according to the detected scanning speed of the bar code scanner signal.

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10 31. The bar code simulator device as claimed in claim 30, wherein the controller comprises a clock signal generator that generates a variable frequency clock signal having a clock cycle, that is coupled to the at least one light source to emit the coded light signal.

15 32. The bar code simulator device as claimed in claim 31, wherein the controller controls the at least one light source to provide the duration of each of the first state and the second state as an integer number of clock cycles of the clock signal.

20 33. The bar code simulator device as claimed in claim 32, wherein the controller controls the clock signal generator to vary a frequency of the clock signal to adjust the duration of each of the first state and the second state according to the scanning speed of the detected bar code scanner signal.

25 34. The bar code simulator device as claimed in claim 31, wherein the controller comprises a driver coupled to the at least one light source and to the clock signal generator, that drives the at least one light source.

35. The bar code simulator device as claimed in claim 23, further comprising a light diffuser coupled to the at least one light source, that diffuses the emitted coded light signal.

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36. The bar code simulator device as claimed in claim 23, wherein the at least one light source comprises an infrared light source that emits light in an infrared frequency band.

37. The bar code simulator device as claimed in claim 23, wherein the at least one light source comprises a visible light source that emits light in a visible frequency band.
38. The bar code simulator device as claimed in claim 23, wherein the at least one light source comprises an infrared light source that emits light in an infrared frequency band and a visible light source that emits light in a visible frequency band.
39. The bar code simulator device as claimed in claim 38, wherein the detection circuitry comprises at least one detector having a detection frequency band of the bar code scanner signal, and wherein in response to detection of the detection frequency band of the bar code scanner signal, the controller controls the at least one light source to emit the coded light signal at the frequency band that corresponds to the detection frequency band of the bar code scanner signal.
40. The bar code simulator device as claimed in claim 23, further comprising a light absorbing area, and wherein the at least one detector and the at least one light source are located within the light absorbing area.
41. The bar code simulator device as claimed in claim 23, wherein the at least one detector and the at least one light source are disposed in close proximity and in substantially vertical alignment.
42. The bar code simulator device as claimed in claim 23, wherein the detection circuitry comprises an automatic gain control device coupled to the at least one detector, that automatically adjusts its gain to accommodate ambient light conditions and an intensity of the detected bar code scanner signal.
43. The bar code simulator device as claimed in claim 23, further comprising a light pipe coupled to the at least one photo-detector that comprises a first portion constructed with a material having a first opacity and a second portion constructed with a material having a second opacity, that focuses the bar code scanner signal on the at least one detector such that a step signal detected bar code scanner signal is provided by the at least one detector.

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44. The bar code simulator device as claimed in claim 43, wherein the detection circuitry comprises a threshold detector that determines if the step signal detected bar code scanner signal is above a certain threshold and provides a threshold detector signal, and
5 wherein the detection circuitry determines from the threshold detector signal whether a bar code scanner that provided the bar code scanner signal is a uni-directional type bar code scanner or a bi-directional bar code scanner.
45. The bar code simulator device as claimed in claim 23, wherein the detection circuitry determines an interval between successive pulses of the detected bar code scanner signal.
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46. The bar code simulator device as claimed in claim 45, wherein the detection circuitry determines a predicted timing of a subsequent detected bar code scanner signal from the interval between detected bar code scanner signals, and wherein the controller
15 controls the bar code simulator device to provide successive coded light signals to correspond with the predicted timing.
47. The bar code simulator device as claimed in claim 23, further comprising a
20 memory device that stores at least one simulated bar code sequence.
48. The bar code simulator device as claimed in claim 47, wherein the memory further comprises a user interface program.
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49. The bar code simulator device as claimed in claim 48, wherein the memory is coupled to the controller that executes the user interface program.
50. The bar code simulator device as claimed in claim 49, further comprising a
30 display.
51. The bar code simulator device as claimed in claim 50, further comprising at least one input device that is coupled to the controller, and wherein the controller is configured to interact with the at least one input device.

52. The bar code simulator device as claimed in claim 51, wherein the controller is further configured such that the contents of the memory can be browsed, displayed, or selected by the at least one input device.

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53. The bar code simulator device as claimed in claim 23, further comprising a scanner that emits the bar code scanner signal, and that comprises a detector that detects the emitted coded light signal.

10 54. The bar code simulator device as claimed in claim 23, further comprising:

a housing having a slot that accommodates insertion of a smart card device and having a surface to which is attached the at least one detector and the at least one light source, the housing containing the detection circuitry, the controller, smart card reading circuitry that reads information from the smart card device, and a processor coupled to the smart card circuitry and to the at least one light source to comprise a smart card to bar code simulating device that reads the smart card device and emits the coded light signal coded with the data from the smart card device.

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55. The smart card to bar code simulating device as claimed in claim 54, further comprising an indicating device that indicates whether a smart card has properly been inserted into the slot.

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56. The smart card to bar code simulating device as claimed in claim 55, wherein the indicating device comprises at least one light emitting diode.

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57. The bar code simulating device as claimed in claim 23, further comprising:
a housing to which is attached the at least one detector and the at least one light source, the housing comprising the detection circuitry and the controller, and having a portion shaped and arranged in the shape of a smart card.

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